

REMARKS

In the Advisory Action dated December 13, 2004, the Examiner maintained the rejections of the claims set forth in the final office action, namely (1) Claims 1, 2 and 5-9 were rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 5,623,598 issued to Voigt et al. ("Voigt") in view of U.S. Patent No. 6,128,717 issued to Harrison et al. ("Harrison"), and (2) Claims 3 and 4 were rejected under § 103(a) as being unpatentable over Voigt in view of Harrison and further in view of U.S. Patent No. 5,586,059 issued to Oshelski et al. ("Okhelski"). Reconsideration and allowance of the application, as amended, are requested.

The present invention is generally directed to a method of presenting system performance to a user in a mass storage system having multiple disk drive storage elements controlled by a disk drive controller. During operation, the disk drive controller receives commands and data from and returns data to multiple host computers. To determine how well the system is performing, the host computers can be operated in time synchronized fashion to test the controller and the disk drive elements. Accordingly, potential problems that can create bottlenecks on communication lines connected from the controller to either the disk drive elements or the hosts can be identified.

The performance of a large storage system is particularly difficult to measure since there are multiple host computers, which connect to the disk drive controllers, and which can operate at the same time in serial or parallel fashion. As a result, a plurality disk drive elements, usually arranged in a disk drive array, operating in either an independent fashion, a RAID configuration, or a mirrored configuration, e.g., can have a significant yet undetectable bandwidth or operational problems that cannot be addressed or discovered when commands are sent only from a single host computer. The present application addresses this problem by executing at a plurality of the host computers a test request by sending commands to the mass storage system in time

synchronized fashion, and accumulating, at the executing host computers, data regarding performance of the mass storage system, in response to the requests sent by the host computers.

Claim 1 is the only independent claim in the present application and, as amended, specifies a method for presenting system performance to a user in a mass storage system. The method features the steps of: (1) executing at a plurality of the host computers a test request by sending commands to the mass storage system in time synchronized fashion, (2) accumulating, at the executing host computers, data regarding performance of the mass storage system, in response to the requests sent by the host computers, and (3) presenting the accumulated data, in a graphical plot format, for enabling the visualization of trends in the performance of the mass storage system as a function of at least one selected parameter, in response to the host generated commands.

In the previous office actions, the Examiner rejected Claim 1 as being obvious over Voigt in view of Harrison. The Examiner contends that Voigt discloses all the limitations of Claim 1 except for a controller connected to a plurality of host computers. The Examiner states that Harrison discloses a controller (interface structure 14) that is connected to a plurality of host computers (i.e., network environment).

The combination of Voigt and Harrison does not disclose each limitation of Claim 1. For instance, neither reference discloses or suggests executing at a plurality of said host computers a test request by sending commands to said mass storage system in time synchronized fashion as specified in the claim.

Voigt discloses a system for identifying methods of improving performance in a data storage system having a single host computer station connected to a data storage system having an array of storage disks. The Examiner acknowledges that Voigt does not teach a controller connected to a plurality of host computers. As previously noted,

there are significant performance issues (e.g., undetectable bandwidth or operational problems) existing in systems with multiple host computers that cannot be addressed or discovered when commands are sent only from a single host computer. Voigt's single host computer system does not face or recognize these problems, much less provide any sort of solution. Accordingly, Voigt does not disclose or suggest sending commands from a plurality of host computers, much less from a plurality of host computers in time synchronized fashion.

The Examiner relies on Harrison for disclosing a controller connected to a plurality of host computers. Harrison discloses a method of recording data onto a disk drive by categorizing the data into data types. Harrison is not directed to solving or even recognizes the problem of determining or presenting system performance to a user of a mass storage system. Furthermore, Harrison is not concerned with the problems associated with measuring performance using even a single host computer, much less multiple host computers operating in time synchronized fashion.

In the Advisory Action, the Examiner states that "Harrison teaches collecting disk data pertaining to the total number of read/write operations (col. 12, lines 45-46), the total number of reads in a time unit (col. 12, lines 47-48), the number of writes in a time unit (col. 12, lines 48-49), and various other types of functional data (col. 12, lines 39-65)." The Examiner contends that this is data on performance.

This portion of the Harrison reference cited by the Examiner describes use of so-called SAPIs (storage application programming interface) for fetching statistics and information about objects that are stored. These are general statistics, e.g., on the status of objects and disks and the numbers of objects accessed; they are not statistics regarding the performance, i.e., on how well some task is accomplished, of the mass storage system.

Even assuming, for the sake of argument, that the data fetched by the SAPIs is considered data regarding performance of a mass storage system, Harrison does not teach or in any way suggest that the data is collected in response to a test request from a host computer. It is unclear from the reference how the SAPI fetched data is collected or when it is collected. However this data is collected, it is not done in response to a test request from a host computer, much less to test requests executed by a plurality of host computers operating in time synchronized fashion.

In addition, as explained in Applicants' previous responses, Harrison and Voigt are not properly combinable under §103. Under §103, teachings of prior art references can be combined only if there is some suggestion or incentive to do so. The Harrison and Voigt references are not properly combinable because neither reference provides any suggestion or incentive for combination with the other.

Claim 1 is thus allowable over the Voigt and Harrison references. The other cited reference, Oshelski, does not cure the defects of Voigt and Harrison. Claims 2-9 are dependent on Claim 1 and are, therefore, also allowable over the cited references.

Claims 1-9 are pending in the present application. As the application is now in condition for allowance, issuance of a Notice of Allowance is requested.

Respectfully submitted,



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